ASHUELOT RIVER FLOOD CONTROL

OPERATION AND MAINTENANCE MANUAL

FOR

FLOOD PROTECTION WORKS

BELOW

KEENE, NEW HAMPSHIRE

U.S. Army Engineer Division, New England

Corps of Engineers

Boston, Mass.

October 1957

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FOREWORD

The successful functioning of flood protective works is not assured by snagging and clearing and channel realignment. If the channel is to function properly during flood periods, it must be carefully maintained during periods of normal river stages.

The need for proper maintenance cannot be too highly stressed in view of the fact that large damages may be incurred through failure of a critical section in flood time, caused by fallen trees or debris that would have been eliminated by proper maintenance.

Necessary maintenance and proper operation require that responsible local persons have a thorough understanding of the functions of the various units of the system and the best methods of maintaining the system. It is the purpose of this manual to provide complete information so that all parties may know their responsibilities in maintaining the flood protection system in accordance with the regulations prescribed by the Secretary of War as amplified by this manual.

The Flood Control Acts approved 28 August 1937 as amended by the Flood Control Acts approved 11 August 1939, 18 August 1941 and 24 July 1946 authorized the Secretary of the Army "To allot not to exceed $1,000,000 from any appropriation heretofore or hereafter made for any one fiscal year for flood control, for removing accumulated snags and other debris, and clearing and straightening the channel in navigable streams and tributaries thereof, when in the opinion of the Chief of Engineers such work is advisable in the interest of flood control. Provided, that not more than $50,000 shall be expended for this purpose for any single tributary from the appropriation for any one fiscal year."

Upon establishment of the Department of Defense, the improvement of rivers and harbors and other waterways for flood control and other purposes, formally under the jurisdiction of the Secretary of War, became the responsibility of the Secretary of the Army. Reference therein to the Secretary of War and War Department shall be construed to mean respectively the Secretary of the Army and Department of the Army. Where reference is made to the District Engineer in the Regulations included in this manual, it shall be construed to mean the Division Engineer, New England Division, Corps of Engineers.

The channel is not designed to carry flood flows of major floods of rare and infrequent occurrence, but only to increase the capacity in a critical reach of the river so that minor floods can be passed without damage. Serious flooding should still be expected in the event heavy rainfall causes runoff in excess of the capacity of Surry Mountain Reservoir and the improved channel.

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SECTION I

INTRODUCTION

1-01. AUTHORIZATION. - Snagging and clearing work on the Ashuelot River, below Keene, New Hampshire was authorized by the Chief of Engineers on 20 August 1953 in accordance with Section 13 of the 1946 Flood Control Act. (Public Law 526, 79th Congress).

1-02. LOCATION. - The project is located along the Ashuelot River from the Railroad Bridge in Keene to the covered bridge at Swanzy Station, a distance of 22,800 feet, as measured along the original stream channel.

1-03. DESCRIPTION OF PROJECT. - The project consisted of the removal and disposal of the following approximate quantities; 50 snags and debris, 260 trees, 45,000 cubic yards of material in the two cutoff channels, the overhanging branches of 50 trees and 20 clump of trees. The total length of the cutoff channels is 1,800 feet and they by-pass 5,600 feet of the meandering river channel.

1-04. PROTECTION PROVIDED. - The project will improve flow conditions in the reach most critical to the operation of Surry Mountain Dam and Reservoir. The previous channel conditions seriously limited allowable discharges. With the larger discharge permitted by the increased channel capacity the emptying period will be shortened and flood storage capacity will be available more quickly.

In addition to the benefits to the reservoir operation, the project will be of material benefit to the City of Keene.

a. Many houses in Keene suffer wet cellars during periods of high ground water table. Some of these are located some distance from the river. The improvement of this channel should shorten the period of high river stages and thus lower the ground water table and reduce the duration and amount of cellar flooding.

b. The drainage and sewerage systems for the City of Keene have flat gradients and do not function well during periods of high water. Local black flows of raw sewage have occurred during the period of high water. The shorter periods of bankfull stages will improve the functioning of these drains and sewers.

c. Farms located just below Surry Mountain Reservoir and between Keene and Swanzey Station include hay fields in the river bottoms. During emptying periods for Surry Mountain Reservoir these fields do not drain well and the ground is either flooded or too soggy to work. The shortening of the period of operation for the Surry Mountain Reservoir will be of considerable assistance to these farmers by increasing the usability of their lands.

1-05. CONSTRUCTION HISTORY. - Construction of the project was initiated on 3 June 1954 and completed on 26 August 1954. On 15 September 1954 the project was turned over to the City of Keene for operation and maintenance. On 29 October

1954, Laurence M. Pickett, Mayor of the City of Keene, accepted the project on behalf of the City. The entire project was constructed by the B & M Construction Co., Inc., P. O. Box 287, Hadley, Massachusetts.

1-06. PLANS. - A set of two (2) drawings, dated October 1953 designated "SNAGGING AND CLEARING OF ASHUELOT RIVER BELOW KEENE, N.H.", sheet 1, Drawing Number CT-4-4048 and sheet 2, Drawing Number CT-4-4049 showing the project as designed and constructed, is included in Appendix D.

SECTION II

LOCAL COOPERATION REQUIREMENTS

2-01. FLOOD CONTROL ACTS. - Section 3 of the Flood Control Act approved June 22, 1936 (Public No. 738, 74th Congress) provides, "That hereafter no money appropriated under authority of this Act shall be expended on the construction of any project until States, political subdivisions thereof, or other responsible local agencies have given assurances satisfactory to the Secretary of War that they will:

"(a) Provide without cost to the United States all lands, easements, and rights-of-way necessary for the construction of the project;

"(b) Hold and save the United States free from damages due to the construction works, and;

"(c) Maintain and operate all the work after completion in accordance with regulations prescribed by the Secretary of War."

The Flood Control Act of 1946, pursuant to the provisions of which construction of the Snagging and Clearing of Ashuelot River Below Keene, N.H. as authorized by the Chief of Engineers, requires that the provisions of local cooperation specified in Section 3 of the Flood Control Act of June 22, 1936 as amended, shall apply.

2-02. ASSURANCES. - The City Council of the City of Keene, N.H. passed a Resolution on February 4, 1954, authorizing the Mayor to sign assurances as described above on behalf of the City. Authority for the City to enter into such agreements with the United States is contained in Chapter 54 revised laws of New Hampshire 1942 entitled "Emergency Public Works". This act authorizes a city to "acquire real estate interest required for this work, to enter into contracts for the purpose of this Project, and to accept aid from the Federal Government for such work".

Copies of the assurances are given in Appendix B of this manual.

SECTION III

GENERAL REGULATIONS

3-01. PURPOSE OF THIS MANUAL. - The purpose of this Manual is to present detailed information to be used as a guide in complying with "Flood Control Regulations - Maintenance and Operation of Flood Control Works" as approved by the Acting Secretary of War on 9 August 1944, and published in the Federal Register on 17 August 1944, a copy of which is bound in the back of this volume as Appendix A. In executing assurances of local cooperation for the Ashuelot River Project, the city has agreed to maintain and operate the completed works in accordance with those regulations. The regulations are intended to cover all local protection projects constructed by the Department throughout the United States, are general in nature, and obviously cannot give detailed instructions for the maintenance and operation of a specific project. The details set forth in this Manual for maintenance and operation of the Ashuelot River Project are intended to supplement the regulations to permit obtaining all the benefits and protection against floods for which the project was designed. Failure to maintain and operate the project as required by the regulations and as detailed herein can cause severe property losses and loss of life and can result in an irreparable loss of confidence in the flood protection system by citizens who have invested their funds on the basis of the protection which it provides.

3-02. GENERAL RULES AND REGULATIONS. - The applicable general rules of the regulations prescribed by the Secretary of War are in quotation marks below and are defined further by remarks under each quotation.

> "(1) The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits."

(a) These requirements cannot be overstressed, and the city authorities must make adequate provisions for funds, personnel, equipment, and materials to allow for the proper maintenance and operation of the flood protection works.

> "(2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of War, as required by law, shall appoint a permanent committee consisting of or headed by an official hereinafter called the 'Superintendent,' who shall be responsible for the development and maintenance of, and directly in charge of, an organization responsible for the efficient operation and maintenance of all

of the structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States."

(a) The committee should be composed of competent members, preferably men experienced in engineering or construction work of a nature similar to the flood protection works. The committee must be given broad authority to carry out its responsibilities. The name, address, and office and home telephone numbers of the Superintendent, and any changes thereof, shall be promptly furnished the Division Engineer.

"(3) ----------Not applicable----------"

"(4) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way for the protective facilities."

(a) The disposal of rubbish, erection of fences, or barriers, or any form of obstruction to flow shall be prohibited.

"(5) No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the War Department or his authorized representatives that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissible under the above determination shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the District Engineer or if otherwise obtained, shall be submitted for his approval. Drawings or prints showing such improvements or alterations as finally constructed shall be furnished the District Engineer after completion of the work."

(a) Any contemplated improvements or alterations as outlined above must be submitted to the Corps of Engineers, Boston, Mass., and the approval of the Division Engineer obtained prior to the city authorizing the work. All requests for approval shall be in writing and complete drawings in duplicate, one set of which shall be in reproducible form, must be submitted along with a full description of the work intended. The city will be held responsible for obtaining prior approval from the Corps of Engineers for any improvements or alterations proposed

by itself, private parties or any public parties. The city shall furnish the Division Engineer as-built drawings in duplicate of the completed work.

"(6) It shall be the duty of the superintendent to submit a semi-annual report to the District Engineer covering inspection, maintenance, and operation of the protective works."

(a) See paragraph 3-05 of this manual for instructions on submitting reports.

"(7) The District Engineer or his authorized representatives shall have access at all times to all portions of the protective works."

(a) The Division Engineer or his representatives will make periodic inspections of the protective works to determine if the project is being properly maintained and operated by the city.

"(8) Maintenance measures or repairs which the District Engineer deems necessary shall be promptly taken or made."

(a) The city should maintain the facilities and keep them in good repair and not wait for the Division Engineer to call such matters to its attention. Upon request, the Division Office will advise the city how to make any major repairs to the facilities.

"(9) ----------Not applicable----------"

"(10) The War Department will furnish local interests with an Operation and Maintenance Manual for each completed project, or separate useful part thereof, to assist them in carrying out their obligations under these regulations."

(a) The flood control committee should familiarize itself with the contents of the manual. The city authorities are encouraged to call on the Division Office of the Corps of Engineers for any additional advice or instructions required by them in carrying out the city's obligations for maintaining and operating the flood protection facilities.

3-03. MAINTENANCE. - a. Maintenance in this manual refers to the care and upkeep of the completed construction work which was turned over to the city. The War Department, through its Division Engineer, endeavored to design the safest system possible, and to see that it was well constructed. If the work is neglected, there will be deterioration and possible failure in flood time when there is dire need of dependable protection.

b. The organization which is responsible for maintenance should always give thought to what it will do when the need arises to operate. From experience gained through maintaining the different parts of the system, it will be in a position to use them effectively in time of stress.

c. Maintenance involves regular inspection of the entire system. The purpose of the inspection is to detect any deterioration or faulty operation that needs repair.

d. Each of the major features of your project will be discussed separately with respect to the points that should be watched, as developed through the use of similar structures over a long period of years.

3-04. OPERATION. - Operation in this manual refers to the actual use of the various features of the protection works during flood periods of the river. It is intended that the procedure outlined herein will be sufficient to insure protection from floods to the design stage. However, advice relative to operation may be secured at any time from the Engineering Division of the New England Division Office.

3-05. REPORTS. - The regulations prescribed by the Secretary of War call for semi-annual reports to be submitted by the Superintendent to the Division Engineer, covering inspection, maintenance and operation. Inspection of the flood protective facilities shall be made immediately prior to flood seasons, immediately following floods and severe winds, and otherwise at intervals not exceeding 90 days as required by the regulations.

(1) Whereas spring is the season in which the majority of floods have occurred, floods can occur in any month of the year.

b. To assist the superintendent in making his inspections and reports, a sample form has been prepared and is included in Appendix C. The superintendent shall have additional copies printed for use in submitting his reports.

c. The semi-annual reports should be submitted in triplicate to the Division Engineer each February and August. The reports will be submitted in letter form with copies of the inspection forms covering the inspections made during the period of the report. The reports shall cover the following points:

(1) A description of the maintenance work performed in the preceding six months.

(2) The number and classification of men working on maintenance, regularly and intermittently.

(3) Description of any work performed by contract on the repair or improvement of the project.

(4) Description of use or operation of the system during the period being reported.

(5) Suggestions relative to public cooperation and comments concerning public sentiment on the protection obtained are considered pertinent and desirable data for inclusion in the report, but such data are not required.

SECTION IV

CUT-OFF CHANNELS

4-01. DESCRIPTION. - Two (2) cut-off channels constructed by the Corps of Engineers are located, respectively, approximately 500 feet above the mouth of Ash Swamp Brook in Keene, and in the vicinity of the mouth of the South Branch of Ashuelot River in Swanzey. The combined length of these two (2) cut-offs is 1,800 feet and they bypass approximately 5,600 feet of winding river. The channel in this reach was obstructed by approximately 40 snags and 100 trees overhanging the river or growing in the river channel. The contractor had the option of constructing these channels with a base width of 70 feet and vertical side slopes or with a base width of 65 feet with 2 on 1 side slopes. The channel cross-sections were designed to approximate the natural channels in the vicinity of the cut-offs which have a width of 60 feet with side slopes varying from vertical to 1 on 1. As constructed, the cut-off channels were over-excavated to some extent.

4-02. MAINTENANCE. - The regulations prescribed by the Secretary of War under paragraph 208.10 (g) (1) give rules for the maintenance of channels and floodways. These rules are quoted here to avoid cross references to the regulations. Brief comments on the particular applicability of these rules to the Ashuelot River project follow each quotation.

> "Channels and floodways - (1) Maintenance. Periodic inspections of improved channels and floodways shall be made by the Superintendent to be certain that;
>
> "(i) The channel or floodway is clear of debris, weeds, and wild growth."

(a) All snags, debris and growth which would tend to restrict the channel shall be removed promptly. However, care shall be exercised not to disturb such growth of grass or vegetation as would tend to stabilize the banks of the channel.

> "(ii) The channel or floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments."

(a) Dumping of waste materials or any types of encroachment on the channel shall be prohibited and prompt steps shall be taken to remove or have removed any such encroachments.

> "(iii) The capacity of the channel or floodway is not being reduced by the formation of shoals."

(a) Existence of shoal areas will be apparent from inspections during times of low flow. Some degree of shoaling is to be expected. The larger shoals which retard flow and deflect flow so as to cause scour and caving banks should be removed. Care should be exercised that slopes of the channels and existing banks are not undercut.

"(iv) Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred."

(a) Serious damage by rain or wave wash is not expected. Considerable sloughing of banks will occur until the gradient in the new channel is established. Where sloughing occurs on the outside of bends due to undercutting of the bank, it should be stopped to prevent meandering or increased length of the channel. In these locations, the lower part of the bank shall be protected. Small trees or brush anchored to the bank, rocks, coarse gravel or other forms of bank protection shall be used to check the flow and resist scour.

"(v) ----------Not applicable----------"

"(vi) Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project works."

(a) In order for this project to function properly, the channels of the Ashuelot River must be maintained in such condition that it is capable of carrying flood flows and not cause the river to back up, thus nullifying the effect of the cut-off channels.

"Such inspection shall be made prior to the beginning of the flood season and otherwise at intervals not to exceed 90 days. Immediate steps will be taken to remedy any adverse conditions disclosed by such inspections. Measures will be taken by the Superintendent to promote the growth of grass on bank slopes and earth deflection dikes. The Superintendent shall provide for periodic repair and cleaning of debris basins, check dams, and related structures as may be necessary."

4-03. OPERATION. - The regulations prescribed by the Secretary of War under paragraph 208.10 (g) (2) give rules for operation of channels and floodways. These rules, quoted here to avoid cross reference, are self-explanatory and require no amplification with regard to the Ashuelot River project.

"(2) Operation. - Both banks of the channel shall be patrolled during periods of high water, and measures shall be taken to protect those reaches being attacked by the current or by wave wash. Appropriate measures shall be taken to prevent the

formation of jams of ice or debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter, all snags and other debris shall be removed and all damage to banks, riprap, deflection dikes and walls, drainage outlets, or other flood control structures repaired."

SECTION V

DRAWINGS AND SPECIFICATIONS

5-01. DRAWINGS AND SPECIFICATIONS. - A complete set of plans and specifications were furnished to the City of Keene at the time of the construction of the project. A full-size set of plans showing the project as actually constructed was furnished the City at the time of transmittal of this Manual. Reduced prints of these drawings are included in Appendix D.

APPENDIX A

REGULATIONS PRESCRIBED

by the

SECRETARY OF WAR

TITLE 33—NAVIGATION AND NAVIGABLE WATERS

Chapter II—Corps of Engineers, War Department

PART 208—FLOOD CONTROL REGULATIONS

MAINTENANCE AND OPERATION OF FLOOD CONTROL WORKS

Pursuant to the provisions of section 3 of the Act of Congress approved June 22, 1936, as amended and supplemented (49 Stat. 1571; 50 Stat. 877; and 55 Stat. 638; 33 U. S. C. 701c; 701c–1), the following regulations are hereby prescribed to govern the maintenance and operation of flood control works:

§ 208.10 *Local flood protection works; maintenance and operation of structures and facilities*—(a) *General.* (1) The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits.

(2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of War, as required by law, shall appoint a permanent committee consisting of or headed by an official hereinafter called the "Superintendent," who shall be responsible for the development and maintenance of, and directly in charge of, an organization responsible for the efficient operation and maintenance of all of the structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States.

(3) A reserve supply of materials needed during a flood emergency shall be kept on hand at all times.

(4) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way for the protective facilities.

(5) No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the War Department or his authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissible under the above determination shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the District Engineer or, if otherwise obtained, shall be submitted for his approval. Drawings or prints showing such improvements or alterations as finally constructed shall be furnished the District Engineer after completion of the work.

(6) It shall be the duty of the superintendent to submit a semiannual report to the District Engineer covering inspection, maintenance, and operation of the protective works.

(7) The District Engineer or his authorized representatives shall have access at all times to all portions of the protective works.

(8) Maintenance measures or repairs which the District Engineer deems necessary shall be promptly taken or made.

(9) Appropriate measures shall be taken by local authorities to insure that the activities of all local organizations operating public or private facilities connected with the protective works are coordinated with those of the Superintendent's organization during flood periods.

(10) The War Department will furnish local interests with an Operation and Maintenance Manual for each completed project, or separate useful part thereof, to assist them in carrying out their obligations under these regulations.

(b) *Levees*—(1) *Maintenance.* The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the structures in time of flood. Measures shall be taken to promote the growth of sod, exterminate burrowing animals, and to provide for routine mowing of the grass and weeds, removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces. Where practicable, measures shall be taken to retard bank erosion by planting of willows or other suitable growth on areas riverward of the levees. Periodic inspections shall be made by the Superintendent to insure that the above maintenance measures are being effectively carried out and, further, to be certain that:

(i) No unusual settlement, sloughing, or material loss of grade or levee cross section has taken place;

(ii) No caving has occurred on either the land side or the river side of the levee which might affect the stability of the levee section;

(iii) No seepage, saturated areas, or sand boils are occurring;

(iv) The drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged;

(v) Drains through the levees and gates on said drains are in good working condition;

(vi) No revetment work or riprap has been displaced, washed out, or removed;

(vii) No action is being taken, such as burning grass and weeds during inappropriate seasons, which will retard or destroy the growth of sod;

(viii) Access roads to and on the levee are being properly maintained;

(ix) Cattle guards and gates are in good condition;

(x) Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained;

(xi) There is no unauthorized grazing or vehicular traffic on the levees;

(xii) Encroachments are not being made on the levee right-of-way which might endanger the structure or hinder its proper and efficient functioning durin times of emergency.

Such inspections shall be made immediately prior to the beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days, and such intermediate times as may be necessary to insure the best possible care of the levee. Immediate steps will be taken to correct dangerous conditions disclosed by such inspections. Regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent.

(2) *Operation.* During flood periods the levee shall be patrolled continuously to locate possible sand boils or unusual wetness of the landward slope and to be certain that:

(i) There are no indications of slides or sloughs developing;

(ii) Wave wash or scouring action is not occurring;

(iii) No low reaches of levee exist which may be overtopped;

(iv) No other conditions exist which might endanger the structure.

Appropriate advance measures will be taken to insure the availability of adequate labor and materials to meet all contingencies. Immediate steps will be taken to control any condition which endangers the levee and to repair the damaged section.

(c) *Flood walls.*—(1) *Maintenance.* Periodic inspections shall be made by the Superintendent to be certain that:

(i) No seepage, saturated areas, or sand boils are occurring;

(ii) No undue settlement has occurred which affects the stability of the wall or its water tightness;

(iii) No trees exist, the roots of which might extend under the wall and offer accelerated seepage paths;

(iv) The concrete has not undergone cracking, chipping, or breaking to an extent which might affect the stability of the wall or its water tightness;

(v) There are no encroachments upon the right-of-way which might endanger the structure or hinder its functioning in time of flood;

(vi) Care is being exercised to prevent accumulation of trash and debris adjacent to walls, and to insure that no fires are being built near them;

(vii) No bank caving conditions exist riverward of the wall which might endanger its stability;

(viii) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged.

Such inspections shall be made immediately prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not exceeding 90 days. Measures to eliminate encroachments and effect repairs found necessary by such inspections shall be undertaken immediately. All repairs shall be accomplished by methods acceptable in standard engineering practice.

(2) *Operation.* Continuous patrol of the wall shall be maintained during flood periods to locate possible leakage at monolith joints or seepage underneath the wall. Floating plant or boats will not be allowed to lie against or tie up to the wall. Should it become necessary during a flood emergency to pass anchor cables over the wall, adequate measures shall be taken to protect the concrete and construction joints. Immediate steps shall be taken to correct any condition which endangers the stability of the wall.

(d) *Drainage structures*—(1) *Maintenance.* Adequate measures shall be taken to insure that inlet and outlet channels are kept open and that trash, drift, or debris is not allowed to accumulate near drainage structures. Flap gates and manually operated gates and valves on

drainage structures shall be examined, oiled, and trial operated at least once every 90 days. Where drainage structures are provided with stop log or other emergency closures, the condition of the equipment and its housing shall be inspected regularly and a trial installation of the emergency closure shall be made at least once each year. Periodic inspections shall be made by the Superintendent to be certain that:

(i) Pipes, gates, operating mechanism, riprap, and headwalls are in good condition;

(ii) Inlet and outlet channels are open;

(iii) Care is being exercised to prevent the accumulation of trash and debris near the structures and that no fires are being built near bituminous coated pipes;

(iv) Erosion is not occurring adjacent to the structure which might endanger its water tightness or stability.

Immediate steps will be taken to repair damage, replace missing or broken parts, or remedy adverse conditions disclosed by such inspections.

(2) *Operation.* Whenever high water conditions impend, all gates will be inspected a short time before water reaches the invert of the pipe and any object which might prevent closure of the gate shall be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed. Manually operated gates and valves shall be closed as necessary to prevent inflow of flood water. All drainage structures in levees shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contact with the embankment. Immediate steps shall be taken to correct any adverse condition.

(e) *Closure structures*—(1) *Maintenance.* Closure structures for traffic openings shall be inspected by the superintendent every 90 days to be certain that:

(i) No parts are missing;

(ii) Metal parts are adequately covered with paint;

(iii) All movable parts are in satisfactory working order,

(iv) Proper closure can be made promptly when necessary;

(v) Sufficient materials are on hand for the erection of sand bag closures and that the location of such materials will be readily accessible in times of emergency.

Tools and parts shall not be removed for other use. Trial erections of one or more closure structures shall be made once each year, alternating the structures chosen so that each gate will be erected at least once in each 3-year period. Trial erection of all closure structures shall be made whenever a change is made in key operating personnel. Where railroad operation makes trial erection of a closure structure infeasible, rigorous inspection and drill of operating personnel may be substituted therefor. Trial erection of sand bag closures is not required. Closure materials will be carefully checked prior to and following flood periods, and damaged or missing parts shall be repaired or replaced immediately.

(2) *Operation.* Erection of each movable closure shall be started in sufficient time to permit completion before flood waters reach the top of the structure sill. Information regarding the proper method of erecting each individual closure structure, together with an estimate of the time required by an experienced crew to complete its erection will be given in the Operation and Maintenance Manual which will be furnished local interests upon completion of the project. Closure structures will be inspected frequently during flood periods to ascertain that no undue leakage is occurring and that drains provided to care for ordinary leakage are functioning properly. Boats or floating plant shall not be allowed to tie up to closure structures or to discharge passengers or cargo over them.

(f) *Pumping plants*—(1) *Maintenance.* Pumping plants shall be inspected by the Superintendent at intervals not to exceed 30 days during flood seasons and 90 days during off-flood seasons to insure that all equipment is in order for instant use. At regular intervals, proper measures shall be taken to provide for cleaning plant, buildings, and equipment, repainting as necessary, and lubricating all machinery Adequate supplies of lubricants for all types of machines, fuel for gasoline or diesel powered equipment, and flash lights or lanterns for emergency lighting shall be kept on hand at all times. Telephone service shall be maintained at pumping plants. All equipment, including switch gear, transformers, motors, pumps, valves, and gates shall be trial operated and checked at least once every 90 days. Megger tests of all insulation shall be made whenever wiring has been subjected to undue dampness and otherwise at intervals not to exceed one year. A record shall be kept showing the results of such tests. Wiring disclosed to be in an unsatisfactory condition by such tests shall be brought to a satisfactory condition or shall be promptly replaced. Diesel and gasoline engines shall be started at such intervals and allowed to run for such length of time as may be necessary to insure their serviceability in times of emergency. Only skilled electricians and mechanics shall be employed on tests and repairs. Operating personnel for the plant shall be present during tests. Any equipment removed from the station for repair or replacement shall be returned or replaced as soon as practicable and shall be trial operated after reinstallation. Repairs requiring removal of equipment from the plant shall be made during off-flood seasons insofar as practicable.

(2) *Operation.* Competent operators shall be on duty at pumping plants whenever it appears that necessity for pump operation is imminent. The operator shall thoroughly inspect, trial operate, and place in readiness all plant equipment. The operator shall be familiar with the equipment manufacturers' instructions and drawings and with the "Operating Instructions" for each station. The equipment shall be operated in accordance with the above-mentioned "Operating Instructions" and care shall be exercised that proper lubrication is being supplied all equipment, and that no overheating, undue vibration or noise is occurring. Immediately upon final recession of flood waters, the pumping station shall be thoroughly cleaned, pump house sumps flushed, and equipment thoroughly inspected, oiled and greased. A record or log of pumping plant operation shall be kept for each station, a copy of which shall be furnished the District Engineer following each flood.

(g) *Channels and floodways* — (1) *Maintenance.* Periodic inspections of improved channels and floodways shall be made by the Superintendent to be certain that:

(i) The channel or floodway is clear of debris, weeds, and wild growth;

(ii) The channel or floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments;

(iii) The capacity of the channel or floodway is not being reduced by the formation of shoals;

(iv) Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred;

(v) Riprap sections and deflection dikes and walls are in good condition;

(vi) Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project works.

Such inspections shall be made prior to the beginning of the flood season and otherwise at intervals not to exceed 90 days. Immediate steps will be taken to remedy any adverse conditions disclosed by such inspections. Measures will be taken by the Superintendent to promote the growth of grass on bank slopes and earth deflection dikes. The Superintendent shall provide for periodic repair and cleaning of debris basins, check dams, and related structures as may be necessary.

(2) *Operation.* Both banks of the channel shall be patrolled during periods of high water, and measures shall be taken to protect those reaches being attacked by the current or by wave wash. Appropriate measures shall be taken to prevent the formation of jams of ice or debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter, all snags and other debris shall be removed and all damage to banks, riprap, deflection dikes and walls, drainage outlets, or other flood control structures repaired.

(h) *Miscellaneous facilities* — (1) *Maintenance.* Miscellaneous structures and facilities constructed as a part of the protective works and other structures and facilities which function as a part of, or affect the efficient functioning of the protective works, shall be periodically inspected by the Superintendent and appropriate maintenance measures taken. Damaged or unserviceable parts shall be repaired or replaced without delay. Areas used for ponding in connection with pumping plants or for temporary storage of interior run-off during flood periods shall not be allowed to become filled with silt, debris, or dumped material. The Superintendent shall take proper steps to prevent restriction of bridge openings and, where practicable, shall provide for temporary raising during floods of bridges which restrict channel capacities during high flows.

(2) *Operation.* Miscellaneous facilities shall be operated to prevent or reduce flooding during periods of high water. Those facilities constructed as a part of the protective works shall not be used for purposes other than flood protection without approval of the District Engineer unless designed therefor. (49 Stat. 1571, 50 Stat. 877; and 55 Stat. 638; 33 U.S.C. 701c; 701c-1) (Regs. 9 August 1944, CE SPEWF)

[SEAL] J. A. ULIO,
Major General,
The Adjutant General.

[F. R. Doc. 44-12285; Filed, August 16, 1944; 9:44 a. m.]

APPENDIX B

ASSURANCES

of

LOCAL COOPERATION

CITY OF KEENE
New Hampshire

Office of
The City Clerk

February 5 1954

TO WHOM IT MAY CONCERN:

I, Lena F. Warren, City Clerk of the City of Keene, New Hampshire, and Clerk of the City Council, hereby certify that the attached is a true copy of a Resolution adopted by the City Council at a regular meeting held on February 4, 1954. All members present with exception of one member. By a showing of hands all members voted in favor of adoption of Resolution.

Attest: /s/ Lena F. Warren
City Clerk, Keene, New Hampshire

Appendix B-1

CITY OF KEENE

IN THE YEAR OF OUR LORD ONE THOUSAND NINE HUNDRED Fifty-four

A RESOLUTION Relating to "Snagging" and clearing of Ashuelot River

Resolved by the City Council of the City of Keene, as follows:

That the Mayor be empowered to negotiate and execute necessary assurances and other instruments between the City of Keene and the Water Resources Board of the State of New Hampshire and/ or the Corps of Engineers, Department of the Army, in connection with the snagging and clearing of the Ashuelot River as indicated on two maps designated "Snagging and clearing of Ashuelot River below Keene, New Hampshire-plan and sections #1 and #2 - both plans being dated October 1953 and numbered CT -4-4048 and CT -4-4049" respectively on file in the office of the City Engineer,

be it further Resolved that the Engineer and City Solicitor procure all necessary permits and easements required for the project and submit said instruments to the Corps of Engineers, Department of the Army, for approval,

and be it further Resolved that a resolution relating to "Snags", Ashuelot River", passed October 15, 1953, is hereby repealed.

Laurence M. Picket /s/
Mayor, Keene, New Hampshire

PASSED February 4, 1954

A true copy
Attest: /s/ Lena F. Warren
City Clerk, Keene, New Hampshire

Appendix B-2

ASSURANCE OF THE CITY OF KEENE, NEW HAMPSHIRE

WHEREAS, the Flood Control Act approved 28 August 1937 as amended by The Flood Control Acts approved 11 August 1939, 18 August 1941 and 24 July 1946 authorized the Secretary of the Army "to allot not to exceed one million dollars ($1,000,000.00) from any appropriations heretofore or hereafter made for any one fiscal year for flood control, for removing accumulated snags and other debris, and clearing and straightening the channel in navigable streams and tributaries thereof, when in the opinion of the Chief of Engineers such work is advisable in the interests of flood control; Provided, That not more than fifty thousand dollars ($50,000.00) shall be expended for this purpose for any single tributary for the appropriations for any one fiscal year"; and

WHEREAS, the Secretary of the Army, under authority of Section 13 of said Flood Control Act of 1946 approved 24 July 1946, has allotted funds for snagging and clearing of the Ashuelot River for flood control purposes, which work is indicated on two maps designated "Snagging and clearing of Ashuelot River below Keene, New Hampshire - Plan and Sections No. 1 and No. 2 - both Plans being dated October 1953 and numbered CT - 4 - 4048 and CT - 4 - 4049", copies of which maps are attached hereto and made a part hereof; and

WHEREAS, the construction work is to be prosecuted under the direction of the Secretary of the Army and the Supervision of the Chief of Engineers, Corps of Engineers, United States Army; and

WHEREAS, said work of channel improvement is subject to provisions of Section 3 of the Flood Control Act of 1936 which provides that no money will be expended on the construction of any project until States, political subdivisions thereof, or other responsible local agencies have given Assurances to the Secretary of the Army that they will (a) provide without cost to the United States all lands, easements, and rights-of-way necessary for the construction of the project; (b) hold and save the United States free from damages due to the construction works;

(c) maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of the Army; and

WHEREAS, the said City desires to prosecute this Project;

NOW, THEREFORE, the City of Keene, New Hampshire hereby Assures the United States of America as follows:

(a) It will provide without cost to the United States of America, all lands, easements and rights-of-way necessary for the construction of the Project,

(b) It will hold and save the United States of America free from damages due to the construction works,

(c) It will maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of the Army.

IN WITNESS WHEREOF, we, the Mayor and City Council of the City of Keene, New Hampshire, acting for and on behalf of said City of Keene, under authority of Resolution dated February 4, 1954, adopted by the City Council of the City of Keene have executed the within Assurance and caused the corporate seal of said City of Keene to be affixed hereto this 4th day of February 1954.

Signed and Sealed
in presence of:

/s/ Lena F. Warren

CITY OF KEENE, NEW HAMPSHIRE

By: /s/ Laurence M. Pickett, Mayor

12 February, 1954

The within Assurance is hereby accepted for and on behalf of the United States of America.

UNITED STATES OF AMERICA

By: /s/ L. H. Hewitt
L. H. HEWITT
Colonel, Corps of Engineers
Division Engineer
Contracting Officer

2/4/54
Approved as to form
/s/ Edward J. O'Brien
City Solicitor

APPENDIX C

INSPECTION REPORT FORM

SNAGGING AND CLEARING ASHUELOT RIVER
BELOW KEENE, NEW HAMPSHIRE
INSPECTION REPORT

FOR PERIOD_____

1. Original River

a. Date inspected by Superintendent _____
b. General condition of river bed regarding snags and debris _____
c. Have any trees fallen or become about to fall into the river? _____
d. Have the banks been damaged by serious scour, rain or wave wash? _____
e. Describe deficiencies, including location, and corrective measures planned _____

_____
_____
_____

2. Cut-off Channels

a. Date inspected by Superintendent _____
b. General condition of channels _____
c. Has the capacity of the channels been reduced due to growth of vegetation, shoaling, or other encroachments? _____
d. Describe deficiencies, including location, and corrective measures planned _____

_____
_____
_____

3. General

a. Have all deficiencies noted in pervious Inspection Report been corrected? _____
b. Has any high water been experienced since the last Inspection Report? _____
If so, describe briefly, including dates, height of water, and effect on protective works _____

_____
_____
_____

Submitted:
(Signed)_____
Superintendent

_____
(Date)

Appendix C

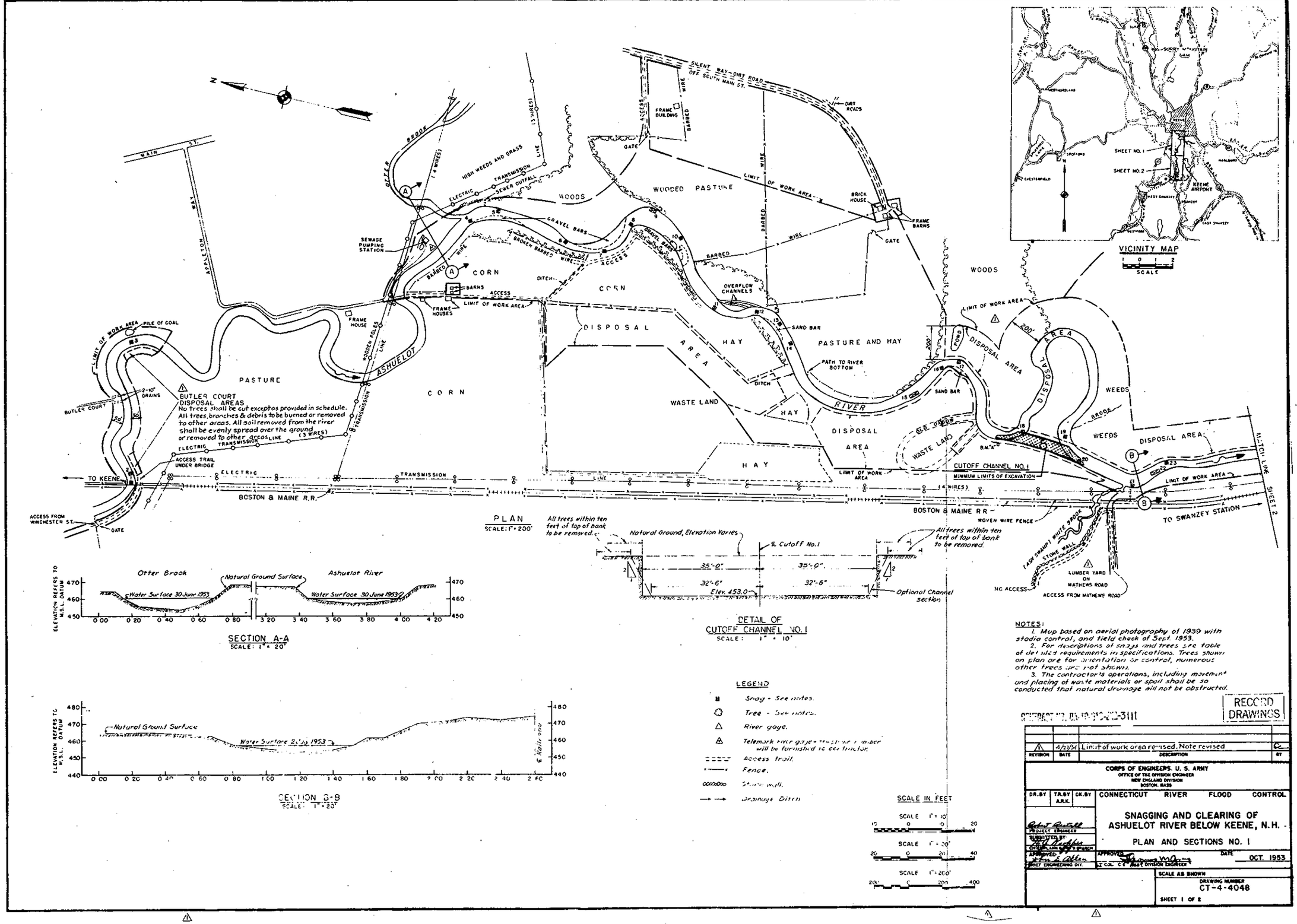
APPENDIX D

DRAWINGS

Title	Drawing No.
PLANS AND CROSS SECTIONS	
Snagging and Clearing of Ashuelot River Below Keene, N. H.	
Plan and Sections No. 1	CT-4-4048
Plan and Sections No. 2	CT-4-4049

CORPS OF ENGINEERS

U. S. ARMY



BUTLER COURT DISPOSAL AREAS

No trees shall be cut except as provided in schedule. All trees, branches & debris to be burned or removed to other areas. All soil removed from the river shall be evenly spread over the ground or removed to other areas.

PLAN
SCALE: 1" = 200'

SECTION A-A
SCALE: 1" = 20'

SECTION B-B
SCALE: 1" = 20'

All trees within ten feet of top of bank to be removed.

DETAIL OF CUTOFF CHANNEL NO. 1
SCALE: 1" = 10'

LEGEND

- Snag - See notes.
- Tree - See notes.
- River gage.
- Telemark river gage - Telemark number will be furnished by contractor.
- Access trail.
- Fence.
- Stone wall.
- Drainage Ditch

SCALE IN FEET

SCALE 1" = 10'
10 0 10 20

SCALE 1" = 20'
20 0 20 40

SCALE 1" = 200'
200 0 200 400

NOTES:

1. Map based on aerial photography of 1939 with stadia control, and field check of Sept. 1953.
2. For descriptions of snags and trees see table of detailed requirements in specifications. Trees shown on plan are for orientation or control, numerous other trees are not shown.
3. The contractor's operations, including movement and placing of waste materials or spoil shall be so conducted that natural drainage will not be obstructed.

RECORD DRAWINGS

CONTRACT NO. DA-19-020-ENG-3111

DIVISION	DATE	DESCRIPTION	BY
1	4/21/54	Limit of work area revised, Note revised	C.

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DIVISION ENGINEER
NEW ENGLAND DIVISION
BOSTON, MASS.

DR. BY	TR. BY	CK. BY
	A.R.K.	

CONNECTICUT RIVER FLOOD CONTROL

SNAGGING AND CLEARING OF ASHUELOT RIVER BELOW KEENE, N.H.

PLAN AND SECTIONS NO. 1

Robert Ruttell
PROJECT ENGINEER

SUBMITTED BY
CHIEF, [illegible] BRANCH

APPROVED
CHIEF ENGINEERING DIV.

APPROVED
Thomas W. [illegible]
LT. COL. C.E. DIVISION ENGINEER

DATE OCT. 1953

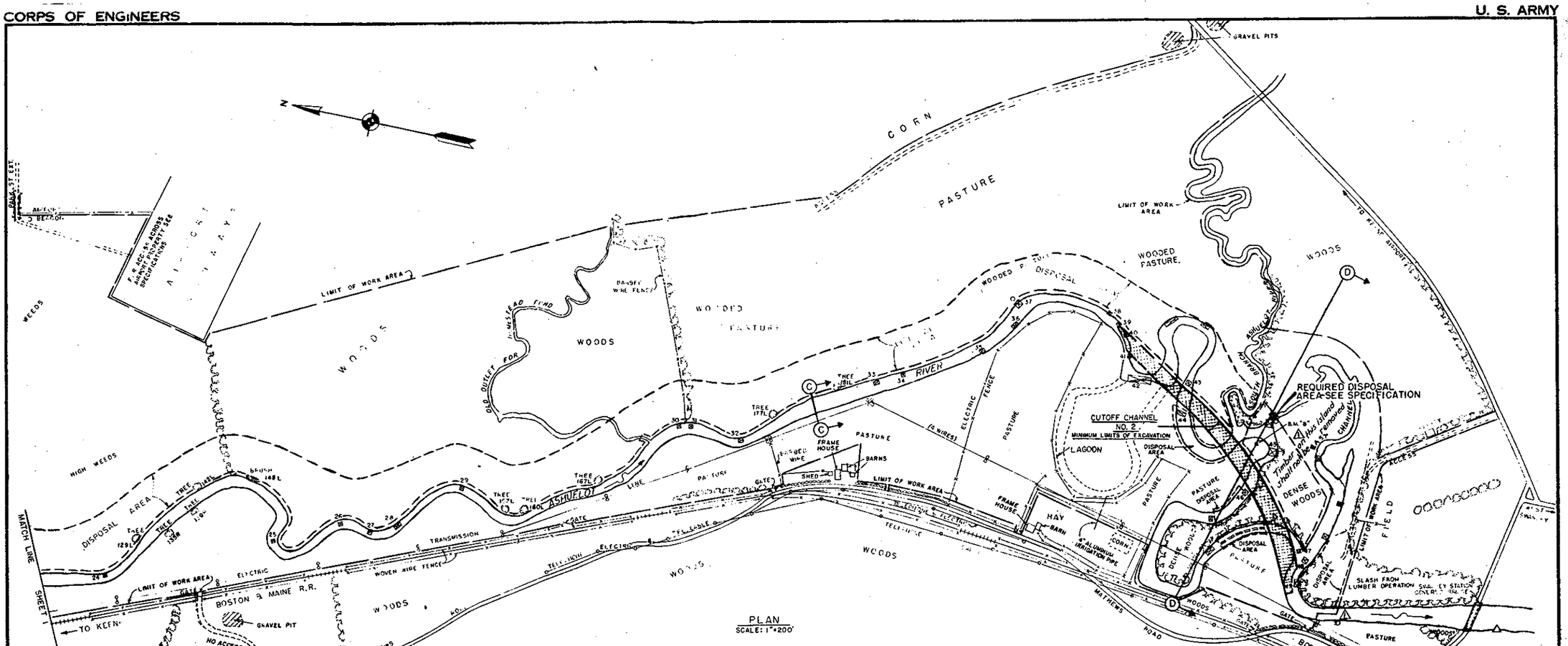
SCALE AS SHOWN

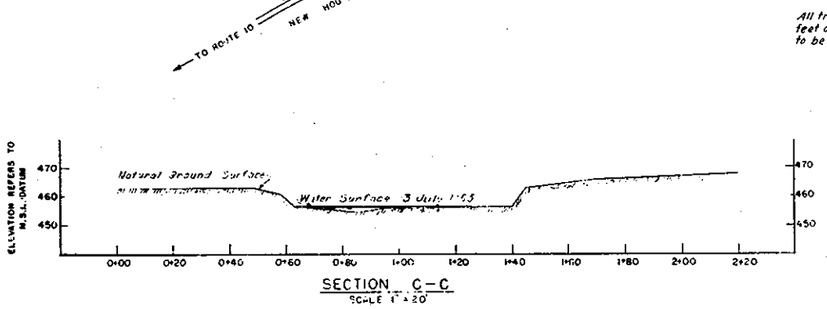
DRAWING NUMBER
CT-4-4048

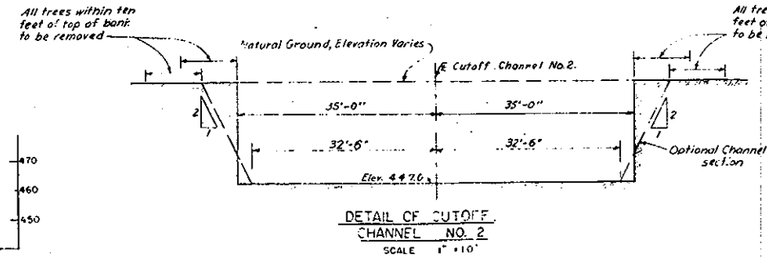
SHEET 1 OF 2

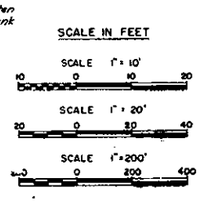
CORPS OF ENGINEERS

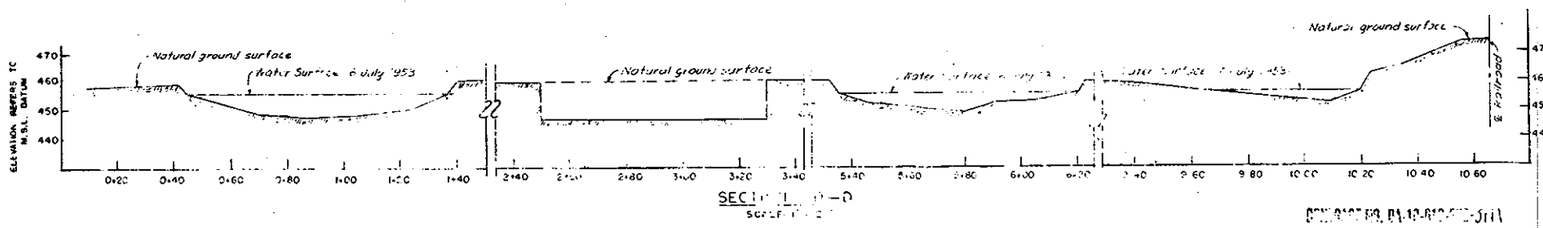
U. S. ARMY











For legend and notes see Drawing No. CT-4-4048 Sheet 1 of 2.

REVISION	DATE	DESCRIPTION	BY
1	4/23/54	Limit of work area revised. Note added	

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DIVISION ENGINEER
NEW ENGLAND DIVISION
BOSTON, MASS.

DR. BY	TR. BY	CK. BY

CONNECTICUT RIVER FLOOD CONTROL

PROJECT ENGINEER

SUBMITTED BY:

CHIEF, CONSTRUCTION DIVISION

APPROVED:

CHIEF, SURVEY ENGINEERING DIV.

SNAGGING AND CLEARING OF ASHUELOT RIVER BELOW KEENE, N.H.

PLAN AND SECTIONS NO. 2

APPROVED:

LT. COL. C.E. ASST. DIVISION ENGINEER

DATE OCT. 1953

SCALE AS SHOWN

DRAWING NUMBER CT-4-4049

SHEET 2 OF 2

RECORD DRAWINGS